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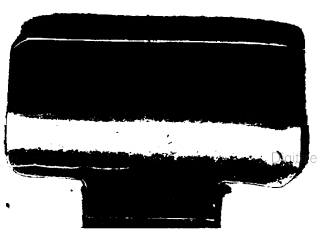

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TRANSPLANTING

LARGE TREES AND SHRUBS.

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TRANSPLANTING

LARGE TREES AND SHRUBS.

BY

CHARLES R. KELLY,

LANDSCAPE GARDENER, TARPORLEY, CHESHIRE.

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DIRECTIONS

FOR

TRANSPLANTING LARGE TREES, ETC.

PART I.

TRANSPLANTING SMALL BALLS.

HAVING had the good fortune to be appointed to a situation where, among other necessary alterations, a good many large old trees and shrubs required to be either transplanted, cut down, or left where their value was nothing compared with what it would become if successfully transplanted to places where they were required, I naturally felt the responsibility of my position, and this feeling was deepened by the fact that the noble lord under whom I have the honour to serve is a great lover of trees. I accordingly set about the business with great care, and, like every "canny Scot," I endeavoured, as clearly as possible, to see the end from the beginning. I have been largely assisted in all my operations by the means, generosity, suggestions, and good sense of my noble employer, who himself has been a successful transplanter.

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I am the more encouraged to record the results of my operations from the fact that several gentlemen have expressed to me their desire to know my system. The plants that have been successfully transplanted here, in the manner described—on the *small*, the *large*, and the *very large* ball system—now number over 200, besides hedges. Of all that number, there has not been *one total* failure, while the number of those that have not grown as well as they did formerly (many having grown much better) is only *three*, or at the most *four*, and they were of very little value. The want of success in those few instances can in no way be attributed to the defects of the system, but can quite easily be traced to other causes. Neither is it due to the *time of year* in which they were transplanted, for we have transplanted successfully plants of the same species in almost every month of the year.

The following measurements of a few of the plants we have transplanted with complete success will show what may be done on this system.

The Small Ball.

Variegated Holly, 11 feet high and 8 feet through the branches.

Cedrus deodara, 12 feet high and 9 feet through the branches.

The Large Ball.

Sycamore, 25 feet high, 2 feet 3 inches in circumference 3 feet from the ground.

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Horse-chesnut, 25 feet high, 1 foot 9 inches in circumference 3 feet from the ground.

Green Holly, 20 feet high and 17 feet through the branches.

Golden Holly, 15 feet high and 10 feet through the branches.

Yew, 12 feet high and 18 feet through the branches.

Thorn, 15 feet high, 2 feet in circumference 3 feet from ground.

Very Large Balls.

Mountain Ash (with large spread of branches), 27 feet high, 3 feet 3 inches in circumference 3 feet from ground.

Yew, 10 feet high: the branches of this tree are about 33 yards in circumference by 33 feet through.

I have not thought it necessary to give a list of trees suitable for transplanting, believing as I do that, if the directions which follow are fully carried out, and improved upon as occasion may require, any kind of tree may be transplanted with perfect success.

I venture to hope that the directions to be presently offered may be of some service to the profession of which I am proud to be a member. I do by no means claim perfection as a guide in transplanting, but I am open to conviction and invite criticism.

It may be proper at this point to remark on the necessity for transplanting large trees: the overcrowded, and consequently unhealthy and unprofitable, state of trees so frequently to be

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seen and deplored by the attentive observer, affords abundant proof of the necessity for transplanting plants of all ages and sizes. Besides, how often, on account of improvements and new buildings, &c., have many beautiful and valuable plants to be cut down, which, if transplanted successfully, would form grand objects in the new landscape, and be at once much larger and finer than can be grown in man's lifetime! No argument is required to convince the proprietor who is a lover of trees of the necessity for and the advantages to be derived from transplanting.

As to the principles on which our practice is to be based, there is a broad field for discussion. We may choose between *the ball*, the *half-ball*, and *no ball*. Each of these has its advocates, and much has been, and doubtless can be, said for them all. But, as I have no desire to disparage the opinion or refute the arguments of anyone, I unhesitatingly confess that my favourite for all old and large plants is *the ball*; but certainly not the ball that sacrifices half the roots, nor yet the small hard ball, in form somewhat like an egg set on its end, and dropped into a hole little larger than itself, which no water can ever penetrate. I propose the adoption of a *good honest large ball*, which takes with it, and without injury, almost all the roots of the tree, and is then planted and watered as will be directed in a subsequent paper of this series. "Whatever is worth doing is worth doing well," and one living tree is surely better than two dead ones. Nor is the dead one worth the money spent in transplanting it, yet

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I trust to convince every intelligent reader that, at the price at which it can be successfully transplanted, the living tree is exceedingly cheap.

The time for the work is autumn and spring: these are undoubtedly the best seasons for transplanting; but any season will suit the good large ball for evergreens, and for deciduous plants any time except in the height of the growing season, or in some instances immediately before the bursting of the bud. The best time for evergreens is during the dry warm summer, when the soil is warm and moderately moist. We transplanted a number of large old evergreens during the dry summers of 1869 and 1870, and in every case with complete success, although the soil was as dry as it possibly could be, and all the water used for the plants had to be carted half a mile. If deciduous trees are transplanted immediately before the bursting of the buds, some of them, such as the birch, will bleed much wherever a root may happen to be cut. It is therefore much better to wait until the leaves begin to unfold (if it cannot be done in autumn). But if the work must be proceeded with at a time when the roots will bleed, char every cut root with a hot iron, and dress the wound with that excellent preparation, "Thomson's Styptic."

THE MODE OF TRANSPLANTING THE SMALL BALL.

The *size* and *form* of the ball are the first things to consider. The size must depend upon the size and habit of the plant, and must therefore be left to the judgment of the person who

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is responsible for the success of the operation. But it is always safe to begin large enough, and if the ball be found to be much beyond the spread of the roots it can easily be reduced. The form I have always found to be most convenient is that

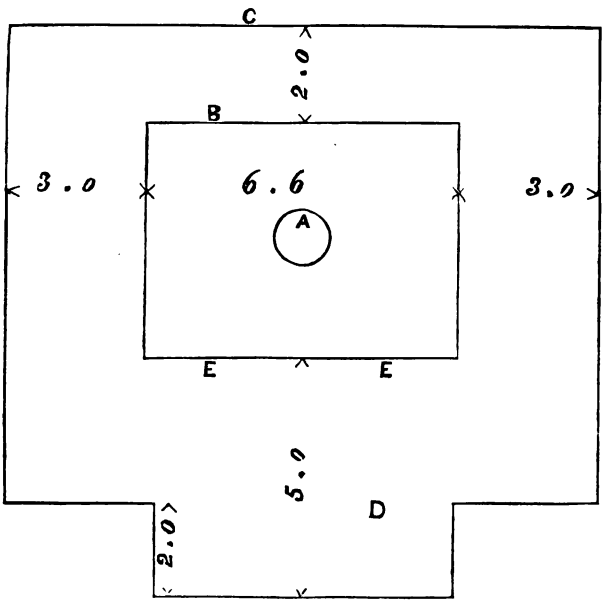

Fig. 1. (One-fourth Scale.)

of a *rectangle;* and for small balls, of which I only mean to speak in this section. Let us suppose the size to be 6 feet or 6½ feet by 5 feet *on the surface,* for the bottom of the ball must always be from 9 to 12 inches less each way, according to the depth of the ball.

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The depth of the ball is the next point to determine, and this, too, like the superficial size, must be decided upon according to circumstances; but the depth of the soil will generally be found to be a sufficent guide. Still, we have frequently found it necessary to go a considerable distance into the subsoil, and even into red sandstone. All those preliminaries having been carefully considered and decided, proceed according to the following directions:—

1. Trace on the surface the size of the ball and width of the trench to be adopted, as in fig. 1.

2. Dig out all the soil between the lines B and C, one or two inches deeper than the ball, leaving the ball widest at the bottom.

3. At E E, and at the depth of the ball, drive an iron bar through as straight and level as possible. Turn the bar round two or three times, so as to leave a hole sufficiently large for the chain; then pull out the iron bar.

4. Insert the needle and attach the chain by means of a strong cord; then draw it through.

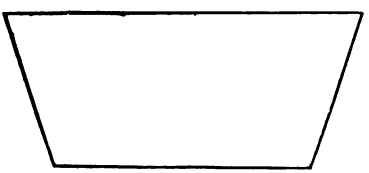

Fig. 2.

5. Reduce the width of the ball at the *bottom*, by cutting neatly from top to bottom, as in fig. 2 (which is a cross section), leaving the ends alone at present.

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6. Fit on, say three boards on each side, the top and bottom board must be good, the middle one must be narrow, and may be of as little value as possible, if only sufficiently strong to be used once. Prop them as in fig. 3.

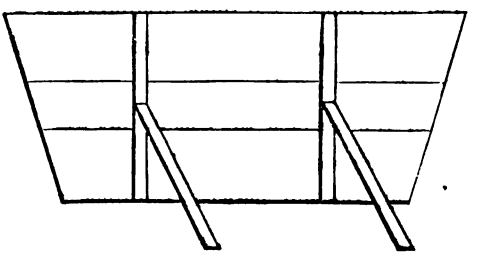

Fig. 3.

7. Fix uprights at each side, and a board along the top of the ball at each side under the chains. The uprights must be in form of fig. 4, and about 3 inches wide, with the flat side next the boards, and the curved side for the chain.

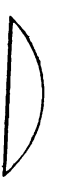

Fig. 4.

8. Draw up the chains over the uprights, and fix their two ends on the top of the ball by a screw, as in fig. 5.

9. Screw the chains tight, and be careful, while they are being screwed up, to tap gently near the bottom of the

Fig. 5.

uprights, to prevent them leaving the boards, and also to

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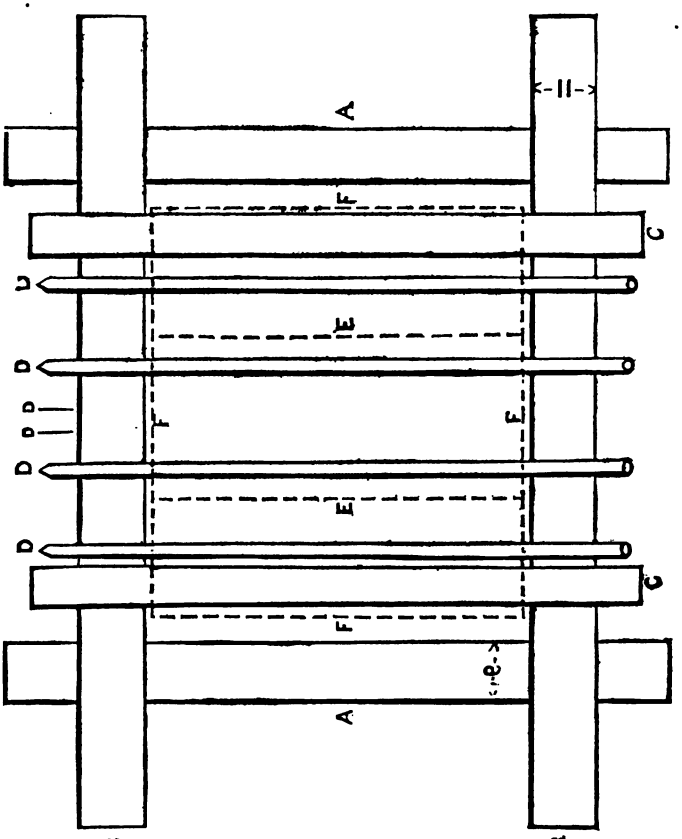

Fig. 6. A A, Stretchers. B B, Side-planks. C C, Bottom End-boards. D D D D D D, Iron Bars. E E, Chains. F F F F, Sides of bottom of Ball. All inside of side-planks and stretchers.

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cause them to bind the bottom of the ball as firmly, and, if possible, more firmly than the top.

10. Dig along outside the sides of the ball wide and deep enough to admit a plank 11 inches by 3 inches, and at the ends a stretcher 6 inches by 4 inches, both of the best red deal. Put in the end-stretchers first, then the side-planks, with their ends resting on the stretchers, as in fig. 6, which represents the bottom of the ball, the upper surfaces of the side-planks, stretchers, chains, and irons.

11. Drive the iron bars, as shown in fig. 6, one at each end beyond the chains, and four between the chains.

12. Shape and board the ends of the ball as directed for the sides, and nail or fix them with screws to the ends of the side-boards.

13. Insert the bottom end-boards, c c, which must be of good oak 6 inches by 1 inch, from the ends, making places for them with the spade. Take special care to have half an inch between the bottom side-boards of the ball and them, so that when lifting they may not have to bear the strain before the irons get it. If necessary, cut a little bit out of the bottom side-board, but always have the bottom end-board close up against the soil.

14. Lift one of the ends under the stretcher with a screw-jack, and pack under the stretcher firmly with square-sided wooden packings. Then repeat the operation at the opposite end.

15. Pass two chains under the ball lengthways. Put

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uprights on the boards that were nailed to the side-boards, and bind them with screws, as directed for the sides.

16. Continue lifting and packing at each end under the ends of the stretchers until of sufficient height to get out of the hole. If you now look under the ball, you will be pleased to observe what a firm, level, and compact bottom it has—as firm, in fact, as the soil, and just as level as the iron bars have been driven. And such will almost always be the case if the work be at all well done. You may lift a hundred plants and not have a single bad bottom, and you may convey them a hundred miles without the least injury. If you have not been deep enough for the roots, you will find them drawn up from the subsoil, and they must now be all neatly cut close to the soil.

17. Put two planks well packed across the hole, and rollers on them under the side-planks. The rollers must be young oak-trees from 6 to 11 feet long, according to the size of the ball, and 6 inches in diameter, and be well hooped, having holes of 1¼ inch near each end.

18. Lower the plant on to the rollers; put an inch bar 3 feet long into the holes at each end of the rollers, then proceed towards the plant's new destination.

19. If the distance be short, two men will with great ease roll the plant along in this manner; while other two men will be required to shift the planks and rollers. Fig. 7 shows ball at this stage.

20. If the distance be great, put two long planks under the

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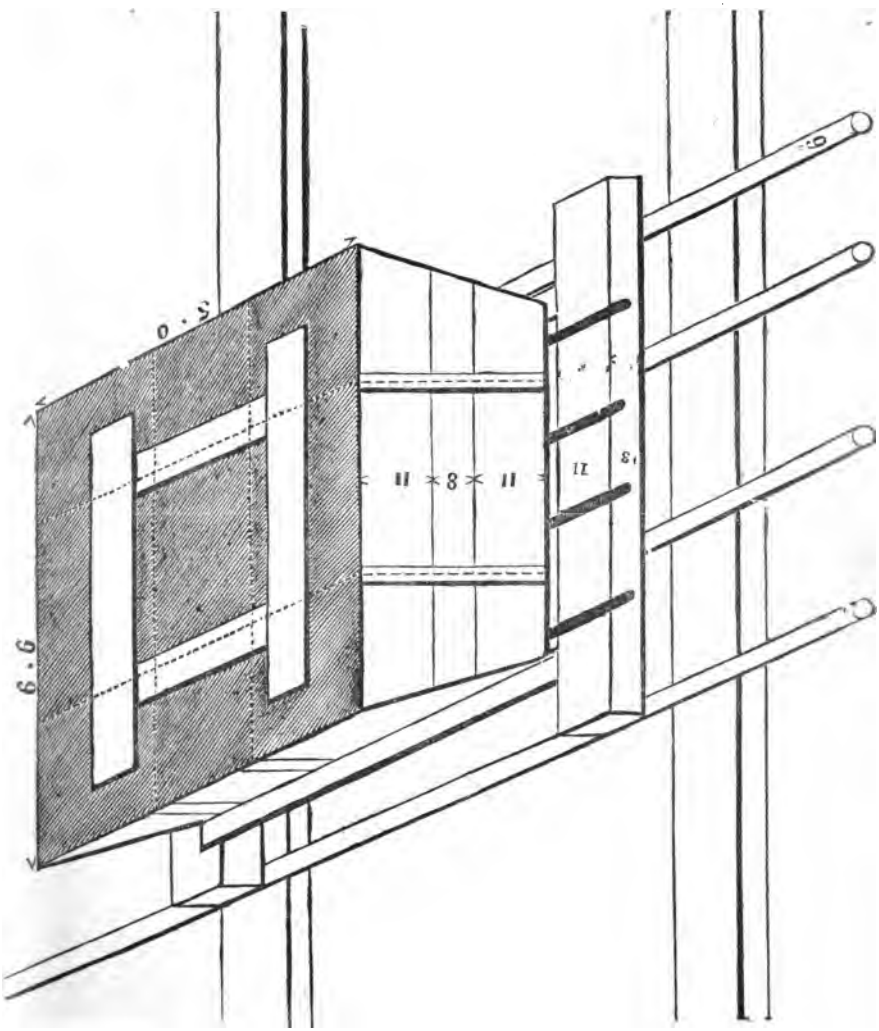

Fig. 7. (Scale Three-eighths of an inch to a Foot.)

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side-planks, having replaced the stretchers between them and the side-planks. Bolt other stretchers to the upper sides of the long planks at each end. Hook a horse to it, or if on firm grass land two horses, without putting planks under the rollers; or roll it on to a low four-wheeled lorry, and pack firmly with litter, leaves, or soil under the bottom of the ball; and so proceed.

21. All the operations described up to No. 19, except the tightening of the chains, can be performed by two men, and for that purpose a third is only required for a short time to turn the screws, that the other two may strike gently the bottom of the uprights at each side or end, as the case may be. Sometimes it may not be possible to go in the same direction as the side-planks, but in such cases put the rollers under the stretchers until you can get them arranged as already directed. It may also frequently happen, when lifting in the hole, that, for want of space, it may be impossible to lift at the ends: in such cases put two more stretchers in the same direction as the side-planks, and lift at the sides. It may also be impossible to lift either at both ends or at both sides. In such cases lift one end pretty high and pack near the other, then lower the end you have raised, which will cause the opposite end to rise; pack this end in a similar manner, and repeat the operation till you have raised it to the desired height. Where the soil is of a strong nature, and bad for driving irons, the directions given in Nos. 5 and 6

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must be performed before those given in Nos. 3 and 4, *i. e.*, the sides must be shaped, boarded, and securely propped before the irons are driven for the chains, to prevent the ball from being shaken.

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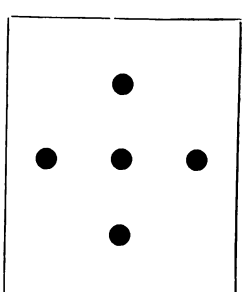
PART II.

THE PLANTING.

ALL the operations up to No. 19 having been successfully performed by two men, while other two have been busy preparing such a hole for the reception of the plant as we shall now describe.

1. *The Hole.*—Take the spot where the plant is to stand as your centre and describe a circle, the diameter of which must be three times the width of the ball. Fix a stake in the centre and other four in this way, at some distance from the centre, so as to be out of the way, to show where the plant is to stand. Remove the centre stake and dig out all the soil inside the circle to the full depth of the soil, laying the best soil next the edge of the hole. Take out the subsoil, so as to allow six or eight inches of the best soil to be put under the ball. Loosen the subsoil all over the bottom of the hole to a considerable depth. Leave an open space on one side, and sloped so as to admit the plant. The two men,



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having thus finished the hole, may now go to the assistance of the two lifters.

2. Balls of this size are easily handled; therefore, to save work, lay planks as directed in fig. 8; two horizontal and two sloping into the hole. Roll gently down until, if you have space, the rollers are resting on the horizontal planks. If there be not sufficient space, get as many as you can on, then remove the sloping planks and move backwards and forwards until the centre of the plant is in a line with each pair of stakes.

3. Lift and take out the rollers and planks, and pack firmly under the stretchers, so that the plant may stand perpendicularly; then ascertain with a line stretched across the hole how much you have still to lower. Make a bottom of the best soil exactly corresponding to the bottom of the ball as it now stands, so that when lowered the plant may still be perpendicular. See that you have sufficient room for the side-planks and stretchers, that they may be quite loose when the bottom of the ball rests on the soil.

4. Lower now to the newly-formed bottom, but beware not to allow one end to rest on it while the other is not touching it. Let the one end *touch* it, but not *press* upon it until you have let the other end fairly down.

5. Lift out the side-planks and stretchers, and pull out the irons, then beat firmly all the best soil round the bottom of the ball.

6. If there are any doubts as to the ball standing unbound,

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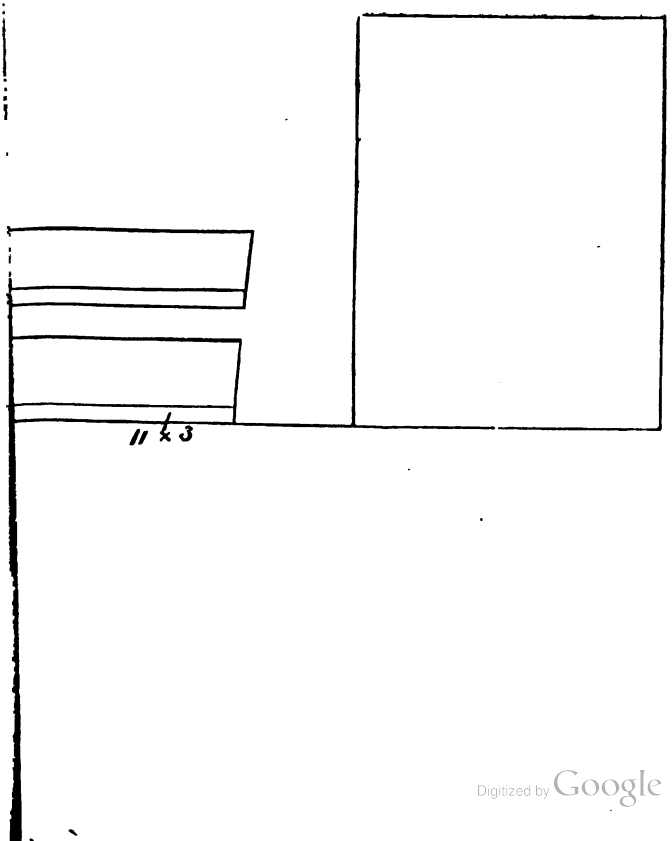

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let two props of little value be attached to each side and end against the middle board.

7. Let the ball be now unbound, and if the work has been well done it will be found nearly as good as when its size was marked out on the surface.

8. Let the two lifters now collect their materials and return to their next plant, leaving the other two to complete the work, who in filling the hole must be careful to put the best soil next the ball, and, if sufficiently dry, beat it as firmly as the ball itself.

9. Let the plant be secured from wind and prepared for water, as directed in next section.

General Remarks.

The size of hole recommended may perhaps seem to some to be too large, but, for reasons well understood by all intelligent practical men, it is no larger than is absolutely necessary for the future prosperity of the plant. Were the ball dropped into a small hole, the space between the sides of the ball and the edge of firm soil would in dry weather act as a drain to starve, and in wet weather as a canal to drown the plant. Besides, in most cases, the work can be more quickly done with a large hole than with a small one. The hole ought to be circular, because, no matter how the plant has to be turned round in order to have its best face in any particular direction, there will be room on all sides to draw out the iron bars, which, in this size of ball, is quite easily done.

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Some may not think it necessary to keep the ball so compact as I have directed; but it is surely of the greatest consequence that the roots should be safely guarded and protected, and can they be better or more securely guarded than by simply not disturbing them? When the plant is *in* the hole, the ball, if necessary, can have as much removed from it as desired, and can even very easily be shaken to pieces without much injury to the roots. But except in removing bad soil, which, in some instances, may form part of the ball, I have never found it necessary to do so. But, as success is the best proof of the system I advocate, I am proud to be able to point out many plants that have been *successfully* transplanted in accordance with the preceding directions, and I confidently leave them to speak for themselves.

All the foregoing operations can be performed as well by *four* men as by *fifty*. But where you have plenty of men at your command, let two remove the soil round the ball, and two bind and lift, &c., while four remove the plant to its new station, or any such arrangement as circumstances may demand. I may, however, state that for such sizes I only employ *four* men—stout, active, common labourers. With men accustomed to the work (when the soil at both places happened to be good) we have frequently lifted *two* plants per day, and transplanted them successfully at the distance of four hundred yards. In counting the cost of transplanting, the value of the plant must always be the primary consideration, and in many instances the cost of transplanting a single

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tree is often very considerable; still it would be much better and cheaper *never* to transplant than not do it *well*.

WATERING.

It is of the first importance that this operation should be performed in a proper manner. It is evident that a firm ball of soil placed among soil that has been well loosened is in great danger of becoming dry, and if once completely dry, there is great difficulty in getting water to penetrate it.

But observe—

1. If the former directions have been fully carried out, there will now be no difficulty in guarding against the danger of the ball getting too dry.

2. The loose soil round the ball has no roots, and therefore requires no water to be directly applied to it.

3. If the water can escape any other way, it will not readily enter the ball.

4. Even if the water be confined to the ball, if in a muddy state, it will with great difficulty, if at all, penetrate it.

5. If water in a *pure* state be properly confined to the ball, it will water it effectually.

6. In order to accomplish this most desirable and necessary end, proceed as directed in fig. 9.

7. The water must be poured only on the straw or mats, as the case may be, and it may be done with considerable force without rendering the water muddy.

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Remarks.

The circle must be in proportion to the size of the ball, but must always be less, while the quantity of water must be regulated according to the season, the nature of the soil, &c. There is no danger but the ball will be perfectly watered, for the water, being put on at the stem, will follow the roots in all

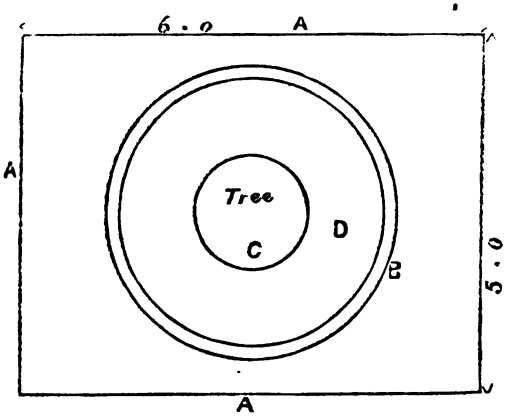

Fig. 9. WATERING. (Three-eighths Scale.)
A A A represents the four Sides of the Ball; B, Wall of Clay Puddle; C, Stem of Plant; D, Basin thus formed, and filled with straw or old mats.

directions. I have watered many balls in this manner when as hard and dry as possible, and always with complete success. Even when the plant is only watered by rain, it is advisable to have this circle properly formed, as it is the most effectual means of ensuring the rain entering the ball. Be careful that the puddle is in close contact with the surface of the ball, so as to allow no escape except into the ball. The remainder of

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the ball and also the soil round it, if not in grass, should be covered with manure or litter.

LARGE BALLS, FROM TEN TO TWELVE FEET.

The directions previously given for small balls apply equally to the large balls, with the following additions:—

1. All the gearing must be stronger and longer, and instead of only two chains across there should be *four*.

2. The ends must be bound before the plant is lifted. Either provide a space at one end to drive an iron bar for them, or, what I have found to answer very well, fasten the ends of two chains to the first bar beyond the bottom end-board, and the screw to each end of the chains on the top, having on the top of the ball boards under them, the same as for the cross binding. Two chains for the end binding will generally be sufficient.

3. Side-planks and stretchers must be of good oak, 10 inches by 6 inches, and strongly hooped at each end, and with a ring in each, so as to be drawn by a horse.

4. The bars must be strong, of 1½-inch iron, with solid heads. The one for driving the holes for the chains must have a crossing near the head, to which the key must be fastened, that it may be turned in the hole for the chains.

5. The packing must be good and firm. It is advisable to fill the hole as the plant is lifted, in order to use less packing.

6. Although six or four men can move such a ball on

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planks and rollers where the ground is nearly level, yet blocks and ropes are preferable where they can be conveniently used, and then one horse will draw it easily.

7. Run nearly horizontally across the hole, and proceed with the greatest care, as directed for the removing and transplanting of small balls (fig. 7).

Remarks.

We have transplanted many valuable plants on this system, and, though some of their balls measured 10 feet by 8 feet, and were nearly 3 feet deep, we have had them rolled with bars on to a lorry, and in this way conveyed some of them to a considerable distance, at a cost, when compared with the value of the plant, very trifling indeed. There are several ways of securing such large plants from winds, but wood is preferable, which should be arranged with due respect to the habits of the plant, and in such a manner as to render the plant perfectly secure.

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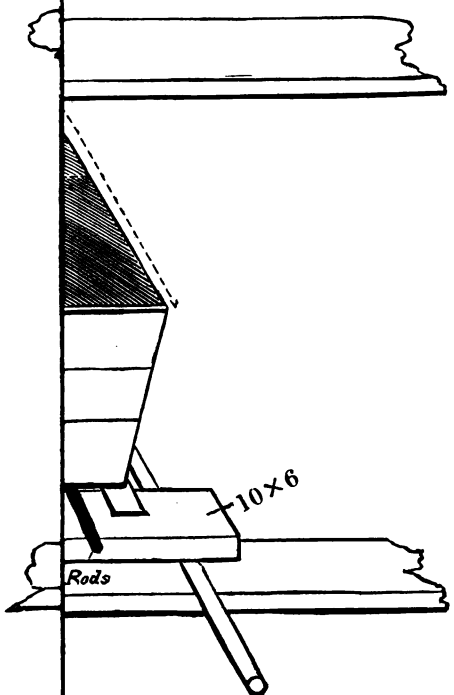

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PART III.

VERY LARGE BALLS, EIGHTEEN TO TWENTY FEET.

After studying the directions already given for large balls, it will be quite evident that only size and strength in stretchers, bars, &c., are required in order to make them suitable for *any size of ball.*

When it is necessary to transplant many very large plants, I would most certainly prefer the large-ball system; but when it is necessary to transplant only a very few large ones, it would scarcely be wise to be at the expense of procuring such an extensive apparatus, and one that might be very seldom in use.

But, as I mean only to record my own experience in transplanting the very large ball, I will now proceed with the necessary directions. In the spring of 1869 I transplanted some very large plants with perfect success according to the directions about to be given.

1. In fig. 11, let A represent the stem of the plant; B B, two ends of the ball; C C, two sides; D D D D, outer side of trench; E, space required for entering planks. The soil must be taken out all round to the full depth of the ball.

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2. At ends B B make room for stretchers 18 feet long and 12 inches by 9 inches, the top of each being three inches lower than the bottom of the ball, and lying perfectly solid.

3. Along the sides C C let the soil be taken out four feet deeper than the bottom of the ball.

4. Begin at the bottom of the ball and undermine to the width of the plank, leaving 18 inches at each end undisturbed. Slip the plank in from the side on the top of the stretchers at each end, and let them be long enough to reach six inches over the end-stretchers; then put a good strong prop in the middle.

5. This prop will divide each side into two equal spaces, at each of which a man must be placed. It will now be the duty of these four men to undermine the whole of the ball.

6. Begin by making room for only one plank at each side; but you will not be able to introduce this plank from the side. You must therefore take it round to space E, and slip it in endways over both stretchers.

7. Do the same at both sides by the two sets of men, and prop firmly as before.

8. Continue to act in the same way, making room for only *one* plank at a time at each side till the four men meet.

9. See that each miner has sufficient assistance to remove all soil excavated, so that when they meet they may have a clear chamber of 3 feet 9 inches high, and 16 feet square, and a good ceiling of the best red deal over their heads, supported by a solid wall of soil at each end, and strong props in the middle.

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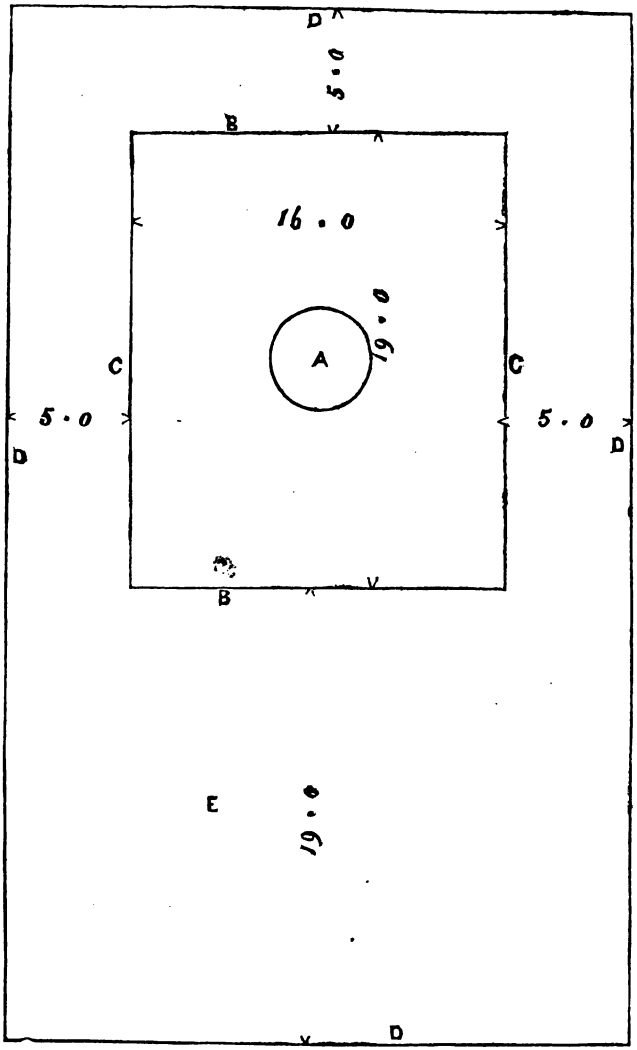

Fig. 11. (One-eighth Scale.)

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10. Put in two or more stretchers, according to the weight of the ball, similar to those already laid down at each end, dividing the space equally according to the number required.

11. Tighten each stretcher up to the planks by means of a screw-jack, and pack them firmly so that one or two of the props may be removed with safety.

12. Having thus made everything secure, dig out each end, B B, to the depth of the bottom of the chamber under the bottom of the ball, taking special care not to undermine the two end-stretchers.

13. Opposite the third or fourth prop from each side make an opening three feet wide under each end-stretcher; then remove these props.

14. Run two beams 22 feet or 23 feet long, 18 inches by 15 inches, or at least 15 inches by 12 inches (according to the depth and weight of the ball), through these openings, right under all the stretchers, having them of equal lengths beyond the ball at each end.

15. Raise them and pack them right under the end-stretchers. Put a strong stretcher under them at each end to lift by, and pack under while lifting.

16. Unless you can get out at the height you will now have reached, you must now prepare to lift the ball high enough to get it out of the hole, and for this purpose you will require to have plenty of good large square-sided packings, and two screw-jacks capable of lifting eight or ten tons each.

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17. Having the two screw-jacks at one end, lift only one end at a time, until high enough, and pack firmly near each end of the stretchers. Fill in the soil at the same time, but pack from the bottom, and not on the newly-filled soil.

18. When high enough for planks and rollers, be sure the planks under the rollers are sufficiently strong and firmly packed. The best means of securing this end is to lay two sets of planks, one set lying across like sleepers, and two right under the beams like rails, with the rollers between them and the beams.

19. If it be found, when on the rollers, impossible to move it by horse-power with ropes and blocks, fix the loose end of the rope to a crab, and four men will move it with ease, two of whom will work the crab, while the other two will keep it supplied with rollers. In this manner it will of course travel much slower than by horses, but if everything has been well done the tree will take no harm if the sides of the ball be kept covered with mats, and damped occasionally underneath with a syringe, and if in the growing season the tree will grow all the time.

20. The hole does not require to be quite so large in proportion as that recommended for large balls; still, let it be ample. The easiest mode is to trench the full depth of the soil, and plant it high, mounding it round. But I would not recommend this plan except as a saving of labour, unless the bottom be damp, which should never be allowed to remain so.

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21. Previous to lowering the plant into the hole, have the bottom well loosened, and six inches of good soil laid over it. Where the packings rest on this soil they must be broad.

22. When over the hole remove all rollers and planks, then lower the plant to a convenient height for packing. Pack under every stretcher under the ball; but no nearer than within 18 inches of their ends.

23. All the weight having now been removed from the beams, lower them and draw them out.

24. Add 15 inches of best soil to that already put under the bottom of the ball, leaving the space under each stretcher clear.

25. Dig a drain opposite each of the stretchers on one side of the ball, so as to allow of their being drawn out.

26. Put the beams along the outside of the ball, under the ends of the stretchers, and also stretchers under the ends of the beams; lift one end at a time and lower the plant gradually to the bottom.

27. Everything except the planks should now be loose. Take them all away, their work is done; ram in soil from each side where the stretchers were; take out gently one plank from each side, and ram the place firmly with soil.

28. The only things requiring force to take them out are the planks, and that is by no means so difficult a task as many may suppose. Fix the crab at the end where space has been made for the beams to be brought out, fasten a

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chain round one plank with ropes and blocks, such as those used for drawing the plant; have a piece of wood, of little value, one-third of the length of the ball. Make a large hole at one end of it, pass a chain through this hole, then fasten the chain to the other end of the plank to be drawn out, at a proper distance to leave the piece of wood under the middle of the ball. When this end of the plank is withdrawn, the centre, which cannot be reached, will be found to be perfectly packed. The ends must be firmly rammed as soon as the plant is withdrawn, and before proceeding to withdraw its neighbour, which will prevent the weight from pressing as much as it would otherwise do on the planks that have still to be drawn. Repeat the operation till the planks have been extracted. Secure from wind and water the plant, as already directed.

29. Or, when it can be done—that is, where the soil is of such a nature as will admit of it (but the party responsible for the safety of his men, as well as of the tree, will be the best judge of this)—let the planks be kept at a distance of 18 inches from each other. In making the bottom, let it be ridged to suit those spaces between the planks. If this be neatly performed, the planks and everything else will remain loose long enough to admit of their being taken out. To afford additional safety to the miners, let a temporary plank be inserted between the permanent ones, but a little shorter, so as not to reach over the end-stretchers, but to rest on the 18-inch wall of soil at each end, and having a prop near

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each end, and also in the middle; but the plank must not be firmly pressed against the roof of the soil. If it remains loose after all the undermining has been finished, let it be dropped to the bottom or taken out before the additional stretchers, as directed in No. 10 are put in; but if it be at all firm, it will not be very safe to take it out. I have never found it necessary to bind balls of this size, but when found necessary, it can easily be done after the ball has been undermined.

Many will doubtless exclaim, "What labour! What expense for the sake of a tree!" My answer is simply that it is great labour and also considerable expense, and all for the sake of a tree; but a *tree*, considered as an ornament, that may safely be valued at £50 or £100 when it has been successfully transplanted, while in its native situation it was not worth as many shillings, and would very probably be doomed to submit to the woodman's cruel axe. It may also be a tree that has braved the storms of some fifty or eighty winters. Why, then, for the sake of a little money, deprive the new landscape of such a valuable and grand ornament. Every lover of trees would at once in such a case say, "*That* tree was planted by a forefather's hand; if possible, have it transplanted successfully; but, if there be any doubt of success" (which I deny), "*then*, woodman, let it stand; thine axe shall harm it not." How many ornaments are to be seen within the palace, the castle, and the hall, which every Briton looks upon with admiration and pride! These are well worth their

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money value; still, they are only the works of art, while the noble old tree is the work of God, and the chief pride and glory of every landscape. Is such a tree, then, not well worth the £20 or £30 spent in transplanting it, when, notwithstanding the tedious and laborious operation, it will often not lose a single leaf, or one hour of its growth? Some may even say, "All that is true; yet can an old bush or tree not be got to grow with much less labour and expense? Why not tunnel a hole through the centre and make other crossings, as you may consider best, instead of excavating all the soil under the ball?" My answer is twofold. Firstly, as I have already said, I do not call this the *best* system. From past experience I decidedly prefer that of moving with large balls (according to directions previously given), which system might admit of certain alterations or improvements to adapt it for use with a planting machine. Secondly, The safest investment is always the best in the long-run, although the interest may be smaller. It will be found by experience that it is by no means an easy matter to tunnel right through a ball some 19 feet by 16 feet. The whole of the soil had much better be removed, which may be done with less labour and less expense, because the men will have room to work, especially when you go five feet instead of four under the bottom of the ball. Where the subsoil is not very hard, a ball of this size can be undermined by four men in less than two days.

One tree in particular transplanted here in the spring of 1869, on the system I have advocated, never had a drop of

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water given it, and yet it not only survived the two following dry summers, but grew as well as any other tree of the same kind, without ever even showing any signs of having been in the least disturbed.

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PART IV.

THE TRANSPLANTING OF LARGE HEDGES.

When a good, large, healthy old holly hedge—say, from 6 to 10 feet high and from 4 to 6 feet through—happens to be in the way, and must therefore be removed, and if there happens to be a place near which is greatly in need of such a fine large hedge for a screen, &c., it would surely be great folly to sacrifice the good healthy hedge when it is so much required in another place, especially when its size is its greatest recommendation, and when it can be transplanted with perfect success for about one-half the cost of planting a young holly hedge of *two-thirds* its size. But suppose the cost of the two were equal, you would still have the difference of size, which of itself would be a decided advantage. To transplant such a hedge successfully, and without fear of losing one plant in a hundred, proceed as follows:—

1. If there is no open end, make an opening at the place most convenient for getting out.

2. Mark out the size of ball and width of trench, as directed for the small ball thus (fig. 12):—

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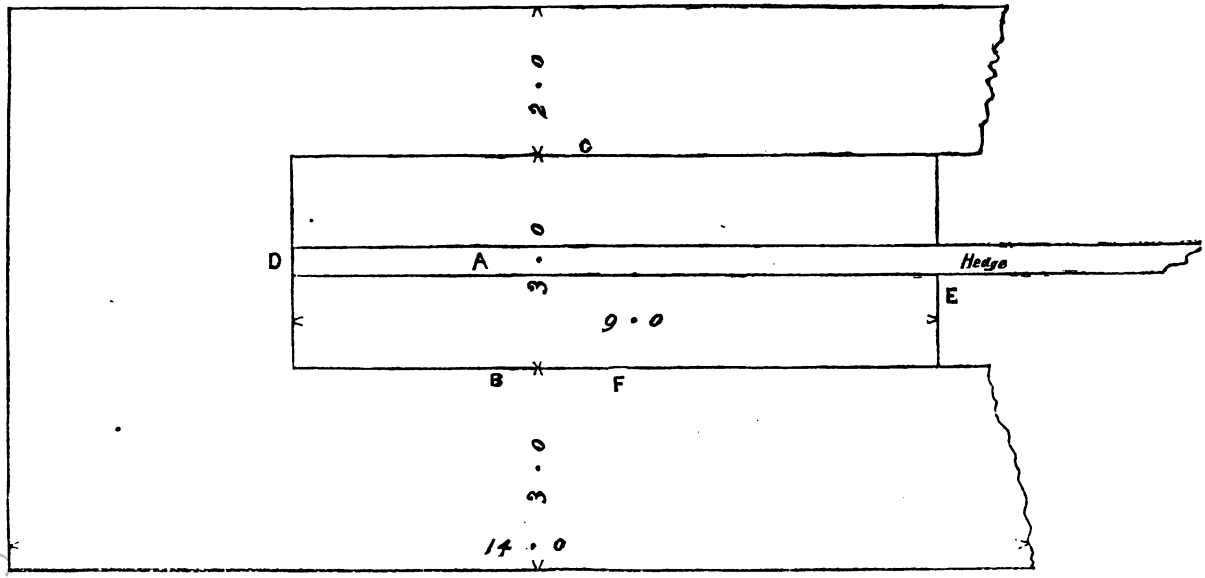

Fig. 12. (Three-eighths Scale.)
A, Stems of Plants. B C, Sides of Ball. D E, Ends of Ball (D, open end). F, Space for driving Irons.

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3. The width and depth of the ball must be regulated by the size of the hedge; but it is always safe to begin wide and deep enough until you learn by experience the size and directions of the roots.

4. Before fixing upon any particular length, you must examine the whole length of the hedge to be transplanted. Then try and discover what lengths will suit the spaces between the plants best, so as to destroy as few roots as possible.

5. The length I have generally found most suitable is about *nine* feet; any shorter cuts the hedge too often, while I have found longer lengths very cumbersome, unless for open spaces; they are also too heavy for two horses when the ground is not level.

6. Dig out the soil as directed for small balls. Shape and board the sides in the same way; also bind with chains and screws in the same manner, having *three* or *four* chains, according to the length of the ball.

7. The end E must not be touched till the ball is bound; then cut it with as little space as possible. An old cross-cut saw will be found very suitable for this purpose where the plants are very close.

8. Board and nail or fix by screws the end D. No binding will be required lengthwise, unless when the ball is very broad.

9. Put in a stretcher at the end D, as already directed; but at E the place for the stretcher must be cut through *below* the ball from each side with the spade.

10. The side-planks must be sufficiently strong, so that they

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will not bend in the middle, and no longer than the ball, except to clear it enough at each end in order to allow the screw-jack to work conveniently. Fix the bottom end-boards and irons as directed for small balls, and be sure to have plenty of them.

11. Either have two screw-jacks (which is the more preferable plan) or lift at each end of the stretcher at E with levers. Observe always to raise this end a little before the other, so as to have a clear space between the end of the ball and the undisturbed soil. Pack this end; then lift the end D with one jack in the middle of the stretcher, as usual.

12. When high enough, place rollers on planks, and on these rollers other two planks—which we shall call *frame-planks*—parallel with the side-planks, but one or two feet wider apart. Then put *three* or *four* stretchers between the frame-planks and the side-planks.

13. Roll the hedge carefully forward a little. Board and nail the end E, and put in the bottom end-board. Bolt a stretcher on the upper side at each end of the frame-planks.

14. You are now ready for the road, and the arrangements of the different parts will be seen to correspond with the following diagram (fig. 13):—

15. Having provided a good road for getting out, hook on two horses, with a good long chain; plank all soft places of the road, supply rollers when required; but, if the distance be much over a hundred yards, without putting a frame under the ball, lift it high enough so as to run a little lorry under-

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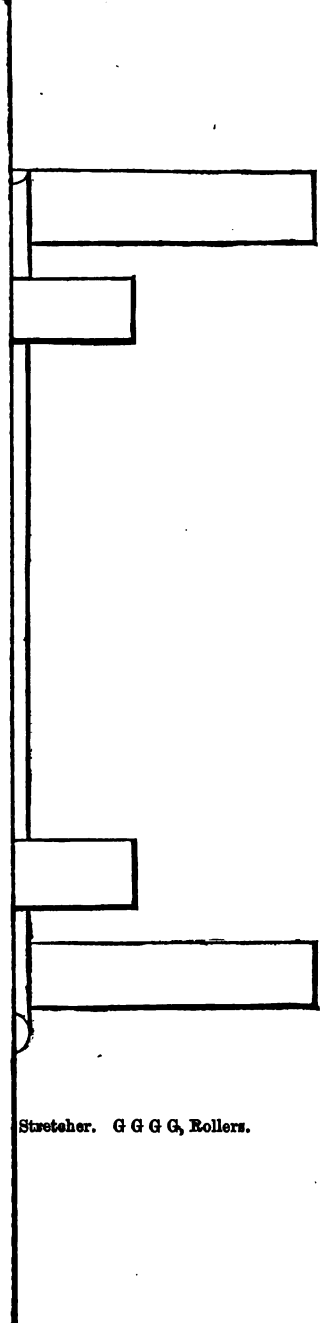

Stretcher. G G G G, Rollers.

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neath; but it often happens that you can get along with rollers where you can't with a lorry.

16. As in the small-ball system, all except tightening the chains up to No. 13 can be performed by *two* men. Let the other two have the hole ready, and then join their neighbours and assist in shifting planks, rollers, &c.

17. The size of the hole will often have to depend upon circumstances; but it should, if possible, be equal to that made by the lifters in taking out the ball, and also, like it, sloped at one end, so as to allow the whole ball, &c., to be run in at once. If the hole is not large enough to admit of this, remove the frame; then run gently in with shorter rollers under the side-planks. A hole less than sufficient to allow of this is too small. Room must also be provided for drawing out the irons.

18. The planting of the first length when both ends are open is the same as that recommended for small balls.

19. The only difficulty to be overcome in the others is in getting them close up against that last planted; and to admit of this the side-planks have been kept short, and if the frame-planks are wide enough apart to admit of their being run up one on each side of the last-planted ball, the difficulty will thus be overcome. Then lift the ball from the frame; remove everything, the lifting being done at the close end by each end of the stretcher, as in No. 11. Where space cannot be provided for this, remove the frame, and run up with rollers under the side-planks.

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In the dry warm summer of 1869 we transplanted in the manner just described about 90 yards of a good healthy holly hedge forty years of age, varying from 6 to 14 feet in height and from 5 to 7 feet in breadth. Being required principally for a screen, its size and inequalities were both in its favour. (See fig. 12.) The only danger lies in cutting the end at E, lest you cut, without knowing it, the principal roots from the end plant; and you will only discover your mistake when the plant dies. From this cause we lost in all our 90 yards some two or three plants (we had them pulled up, and convinced ourselves that this was the cause); while all the remainder went on in their growth as usual, with the exception of a very few of the very large plants, whose roots had been too much punished, on account of the ball not being quite deep enough. For the first two or three days their growth (which was 3 or 4 inches) flagged in the very hot sun; but, after being syringed for two or three evenings, at the end of the third day they resumed their growth, and ever after continued quite fresh and healthy.

We have also transplanted privet hedges of considerable sizes in the same manner and with similar success.

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PART V.

THE TRANSPLANTING OF HIGH TREES.

Trees of too great a height to be conveniently taken to their new situation in an upright position require to be laid on one side.* Although I have transplanted on this system with complete success, I beg to inform my readers that, while all my previous directions and suggestions have been founded upon experience and practice, yet this section is almost all *theory*: at least so far as regards the poles and coupling irons, as I used ropes instead.

1. Having selected your tree and determined the size of ball, let it also be settled on which side the tree is to be laid down.

2. Instead of the ball being bevelled as usual, it should be cut nearly plumb, and at the side on which the tree is to lie it should be narrowed as in fig. 14.

3. See that the side-planks, boards, stretchers, and chains are sufficiently strong and of the proper size. Have them very neatly and firmly put on, and the irons driven as truly and equally as possible.

4. Let four poles, long enough to reach three parts up the

* Where head-room cannot be had.

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tree, be fixed firmly with iron to the four corners of the ball, binding on both stretchers and side-planks, extra stretchers being firmly bolted on the upper side of side-planks for that purpose.

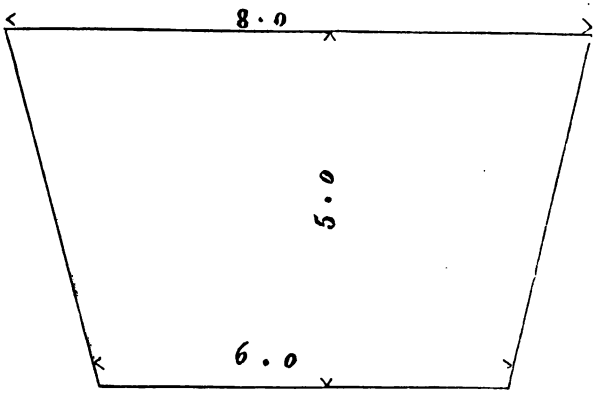

Fig. 14. (Three-eighths Scale.)

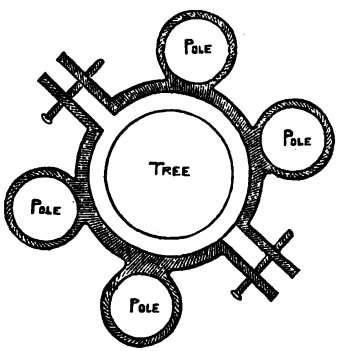

Fig. 15. (Inch Scale.)

5. Let the four poles be fitted to the boards of the ball, so as to come as near the tree at their upper ends as required.

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6. Let them be fixed at their ends somewhat as in fig. 15, and also at two or three places between this and the ball, as

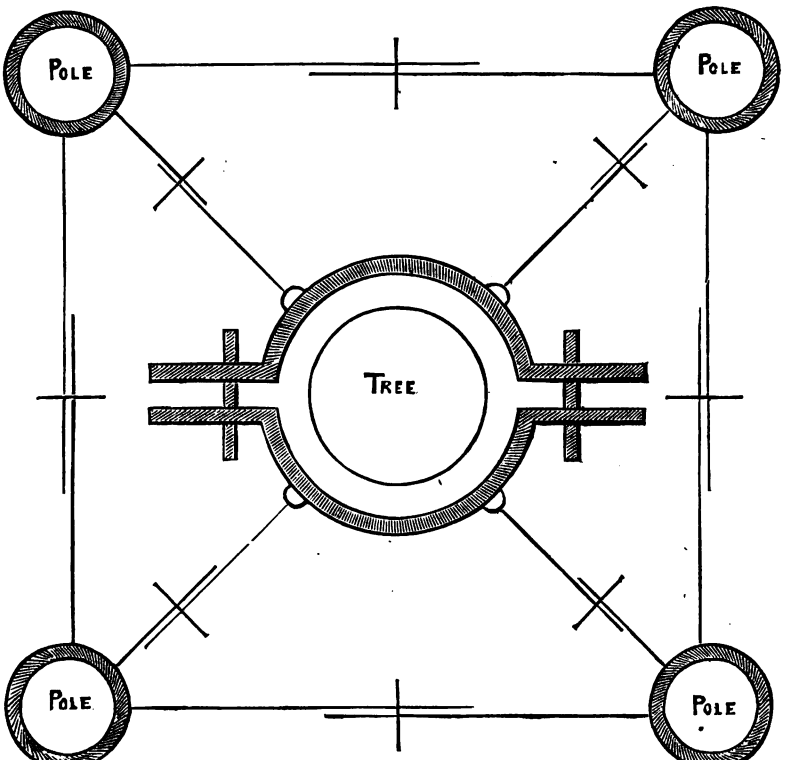

Fig. 16. (Inch Scale.)

in fig. 16, with iron made so as to allow two or three inches of soft packing between them and the tree.

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7. At the top of the ball let them be fixed as in fig. 17, not to the tree, but firmly down to the top of the ball, which should be all covered with boards before being bound with the chains.

8. Lift in the ordinary way till high enough to get comfortably under the ball. Pack firmly at each corner, then fit boards neatly between the irons; let the boards be thicker than the irons, so that when bound lengthways they may be held firmly; but don't allow these boards to overlap the side-planks. Fit pieces similar to the uprights, for the sides and ends, along the bottom, for the chains to work on.

9. Bind in four or six places lengthways, according to the size of the ball.

10. See that the fixings of the poles above the ball are quite firm, to prevent any play between the boards and them for the ball to come and go.

11. You will now be prepared to remove the tree in an upright position to a covenient place for laying it over on its proper side. You can either load before or after laying it down.

12. Lay gently down with blocks and ropes, and if the tree be heavy fix the loose end of the rope to a crab.

It is evident that a tree firmly fixed as I have suggested could only move all in a piece, and I consider that the great desideratum in preparing a tree for being transplanted on what I may call the *laying-down system.*

These directions would require to be much more precise

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and in greater detail if they were meant to be strictly wrought by. But, as already stated, they are merely theory and sugges-

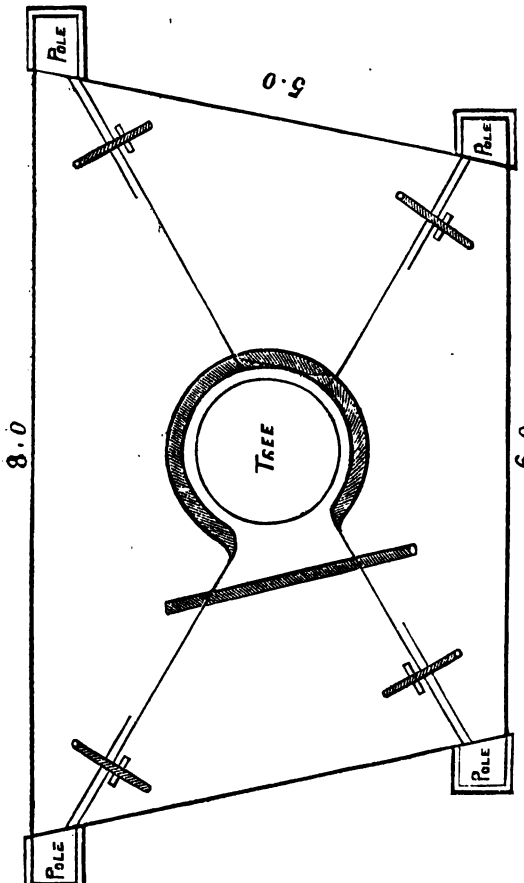

Fig. 17. (Half-inch Scale.)

tions in so far as relates to the poles and iron couplings; and, as I have never reduced them to practice myself, I merely give

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them for what they are worth, as I do not wish rashly to give advice to others which if I were myself putting into practice I might very probably find faulty in many respects.

TRANSPLANTING MACHINES.

None of my preceding directions and suggestions have had any reference to any transplanting machine. My main reason for this is that I have never used any other than such as I have described, and I can therefore neither condemn one nor praise another. My principal reason for never having used a transplanter is that I have never either seen or read of one which I considered able to do the work where I required it, and much less capable of being applied to such trees as I required to transplant. Among other things, I consider a good transplanter ought to be able to accomplish with ease and advantage to all concerned the three following particulars, viz. :—

1. It should be able to drive, or bore holes for, and draw iron bars surely and steadily from *ten* to *thirty* feet in length and of proportionate strength and weight.

2. It should be able to lift at *four* corners, or at four points near these corners, a ball from *ten* to thirty feet square and *five* feet deep, being capable of contracting for the one and expanding for the other.

3. It should be capable of travelling steadily over grass

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lands without sinking; and these and all its other operations must be accomplished by that power which has performed far greater wonders—the power of steam.

CONCLUSION.

In conclusion, I would most earnestly exhort my readers, and especially those who intend to transplant, to have everything, even the most trifling, performed with the greatest care and precision, as that secures at once the success of the plant and the safety of the men employed. Without this there will be safety for neither men nor plant, and more especially in the case of large balls.

In order that the work may be done with perfect safety and at a reasonable cost, attention should be given to the following particulars.

1. Do not be afraid of making the trench round the ball too large. If dug to a sufficient width at first, you will receive compensation for any extra labour and time in making it so in the greater ease and expedition with which you will be able to perform all the other operations. The same remarks apply to securing sufficient space for side-planks and stretchers. If these directions be not properly attended to, the time required to do many little things will be sure to be doubled.

2. See that everything is of sufficient strength for the size of the ball to which it is to be applied. All planks, stretchers,

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rollers, &c., should be securely hooped near each end, so as to prevent their splitting.

3. Practice alone will make a man a good driver of irons, but still a great deal may be done by care so as to drive them straight and level.

4. Take special care never to lift with only *one* screw-jack at each end; nothing is more dangerous, and you should either have *four*, or at least *three*—two at one end and one or two at the other—or be content to lift one end at a time with either one or two.

5. Never lift the one end very much higher than the other, else when lifting the low end the plant is almost sure to be pushed forward. When this does happen, prop firmly at the high end.

6. The greatest care should always be exercised with regard to the building of the packings. See that they are square and flat-sided on at least *two* sides, and firmly and perpendicularly built.

7. When it can be done, always shape the ball like the keystone of an arch, and if the ball be of the proper size, and if all the other directions have been properly attended to, the plant may be carried with all safety from John o' Groat's to Land's End, and it will grow all the way.

There are other subjects, such as soils, trenching, draining, &c., all closely connected with transplanting; but I shall offer no remarks upon these, simply because they have all been ably and fully treated by parties whose opinions upon such

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matters are fully entitled to attention and respect. But I would repeat that if my directions are only properly attended to there can never be any fear of the safety of either *men*, *tree*, or *money*.

THE END.

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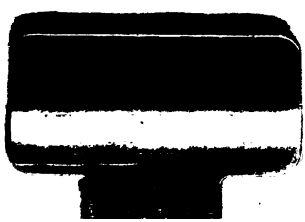

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